

REMARKS

Initial remarks:

Applicant initially notes with appreciation the Examiner's indication in the August 4 Office Action that Claims 12, 13, 19, 21, 33-39, 51, 52, 58, 63 and 64 would be allowable if appropriately rewritten. In this regard, new independent Claims 65, 66, 67, 68, 69 and 70 include limitations corresponding with dependent Claims 12, 13, 19, 21, 51, and 52, respectively, rewritten in independent form and are therefore believed to be in condition for allowance and such disposition is respectfully requested. Additionally, independent Claim 32 has been amended consistent with dependent Claim 33 and independent Claim 56 has been amended consistent with dependent Claim 58. Therefore, Claims 32 and 56 and all claims depending thereon are also believed to be in condition for allowance and such disposition is respectfully requested.

Claim rejections under 35 U.S.C. § 112

In view of the amendment made to Claim 26 herein, Applicant respectfully requests that the rejection of Claim 26 under 35 U.S.C. § 112 be withdrawn.

Claim rejections under 35 U.S.C. § 102 and/or 35 U.S.C. § 103:

In the August 4 Office Action, the Examiner rejected independent Claims 1, 27, 30, 46 and 56 under 35 U.S.C. § 102(e) contending such claims are anticipated by United States Patent No. 6,501,869 to Athale, and rejected independent Claim 32 under 35 U.S.C. § 103(a) contending that such Claim is obvious in view of Athale.

Applicant respectfully disagrees that Athale discloses or renders obvious to one skilled in the art Applicant's invention as set forth in independent Claims 1, 27, 30, 32, 46, and 56 as amended herein, and respectfully submits that such independent claims and all claims depending directly or indirectly therefrom are in condition for allowance. In this regard, as noted above, independent Claims 32 and 56 are believed to be in condition for allowance.

Regarding independent Claims 1, 27, 30, and 46, as summarized more fully below, in each of these claims there are at least two non-parallel unit normal vectors associated with the orientations wherein the reflective microstructures reflect the optical signals from the originating locations to the

target locations. However, as summarized more fully below, vectors normal to the reflective surfaces of Athale's cantilever beam deflectors will all be parallel when the cantilever beam deflectors in Athale are tilted down into their reflective positions within the waveguides to redirect optical signals therefrom.

More specifically, independent Claims 1, 27 and 30 are directed to systems for redirecting optical signals comprising at least one substrate having a first surface and at least one reflective microstructure array formed on the substrate. The reflective microstructure array includes at least one reflective microstructure, with each reflective microstructure of the reflective microstructure array including an optically reflective surface and being positionable with respect to the first surface of the substrate in at least one orientation wherein the reflective surface thereof is positioned to redirect an optical signal from at least one originating location to at least one target location. Each such orientation of each reflective microstructure is defined by an associated unit normal vector orthogonal to the reflective surface thereof. A set of unit normal vectors comprising substantially all of the unit normal vectors associated with each such orientation of each reflective microstructure wherein the reflective surface thereof is positioned to redirect an optical signal from at least one originating location to at least one target location includes at least two unit normal vectors that are non-parallel.

In Claim 1, an average normal vector associated with the reflective microstructure array comprising the average of the unit normal vectors in the set of unit normal vectors forms an acute angle with a vector normal to the first surface of the substrate that is greater than five degrees. In Claim 27, an average normal vector associated with the reflective microstructure array comprising the average of the unit normal vectors in the set of unit normal vectors forms a first angle with a vector normal to the first surface of the substrate that is greater than five degrees, and a set of second angles measured between projections of each unit normal vector in the set of unit normal vectors onto the first surface of the substrate and a reference axis defined on the first surface of the substrate span a range that is greater than two degrees. In Claim 30, a set of angles measured between projections of each unit normal vector in the set of unit normal vectors onto the first surface of the substrate and a reference axis defined on the first surface of the substrate span a range that is greater than two degrees and less than one-hundred eighty degrees.

Independent Claim 46 is directed to a method of redirecting optical signals from originating locations to target locations that includes positioning each reflective microstructure of a reflective

microstructure array fabricated on a first surface of a substrate in an appropriate orientation with respect to the first surface of the substrate for receiving an optical signal from a specified originating location and reflecting the optical signal to a specified target location. Each such orientation of each reflective microstructure is defined by an associated unit normal vector that is oriented orthogonal to a reflective surface of each reflective microstructure. Optical signals are received on the reflective surfaces of the reflective microstructures from the specified originating locations for which the reflective microstructures are appropriately oriented, and the optical signals received on the reflective surfaces of the reflective microstructures are reflected to the specified target locations for which the reflective microstructures are appropriately oriented. In the positioning step, there are at least two non-parallel unit normal vectors associated with the orientations of the reflective microstructures wherein the reflective surfaces thereof are oriented for receiving an optical signal from a specified originating location and reflecting the optical signal to a specified target location. Also in the positioning step, an average normal vector comprising substantially all of the unit normal vectors associated with the orientations of the reflective microstructures forms an acute angle with a vector normal to the first surface of the substrate that is greater than five degrees.

Athale does not disclose the systems or method of independent Claims 1, 27, 30 and 46. Among other differences, Athale does not teach operative orientations of the reflective microstructures within a particular reflective microstructure array wherein two or more of the unit normal vectors are non-parallel. In this regard, in the NxM cross connect optical switch illustrated in FIG. 19 of Athale, the input light beams (1910, 1920, 1930) propagating down the x-axis waveguides (1916, 1926, 1936) in the first optical switch (1990) are redirected out of the x-axis waveguides by tilting appropriate cantilever beam deflectors (1911-1915, 1921-1925, 1931-1935) at forty-five degrees into the x-axis waveguides. Similarly, appropriate cantilever beam deflectors (1941-1943, 1951-1953, 1961-1963, 1971-1973, 1981-1983) in the second optical switch (1992) are tilted into their respective y-axis waveguides (1946, 1956, 1966, 1976, 1986) by forty-five degrees to direct the optical signals received from the first optical switch down the y-axis waveguides. Thus, when in their active orientations, namely, the orientations in which they reflect the optical signals, the cantilever beam deflectors within each array of deflectors have parallel unit normal vectors.

Based upon the foregoing, pending independent Claims 1, 27, 30 and 46, as well as their corresponding dependent claims are allowable over Athale. There is therefore no need to separately

address the patentability of each dependent claim and/or the Examiner's interpretation in relation to any of the dependent claims or any of the references of record in relation thereto.

Conclusion:

In view of the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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